Journal of Microscopy

1991. Vol. 165 Contents and Indices

Joint Editors: P. Echlin, K. M. Knowles,
T. Mattfeldt, J. B. Pawley, D. B. Williams

EDITORIAL ADVISORY BOARD

M. J. Goringe, U.K.
C. Hammond, U.K.

B. Afzelius, Sweden
*M. A. Browne, U.K.
A. Boyde, U.K.
S. Bradbury, U.K.
G. J. Brakenhoff, The Netherlands
Gillian R. Bullock, Switzerland
K. Carlsson, Sweden
J. N. Chapman, U.K.
A. V. Crewe, U.S.A.
A. G. Cullis, U.K.
*Audrey M. Glauert, U.K.
C. Fiori, U.S.A.
R. M. Glaeser, U.S.A.
D. T. Grubb, U.S.A.
*C. V. Howard (I.S.S. President) U.K.
A. Howie, U.K.

*D. E. Johnson, U.S.A.
*D. C. Joy, U.S.A.
J. V. P. Long, U.K.
M. H. Loretto, U.K.
*G. W. Lorimer, U.K.
D. E. Newbury, U.S.A.
*A. J. Morgan, U.K.
*T. F. Page, U.K.
M. Petran, Czechoslovakia
H. Pillar, Germany
M. Pluta, Poland
B. Ralph, U.K.
L. Reimer, Germany
F. W. D. Rost, Australia
J. D. Shelburne, U.S.A.
*Ryuichi Shimizu, Japan
U. B. Sleytr, Austria
*D. J. Smith, U.S.A.
*W. M. Stobbs, U.K.
T. Takahashi, Japan
K. Tanaka, Japan

*H. J. Tanke, The Netherlands
B. F. Trump, U.S.A.
E. R. Weibel, Switzerland
M. A. Williams, U.K.
*T. Wilson, U.K.

Representatives for the International Society for Stereology
J.-L. Chermant, France
A. J. Baddeley, The Netherlands
*L. M. Cruz-Orive, Switzerland
H. J. G. Gundersen, Denmark
C. Lantuéjoul, France
R. E. Miles, Australia
*J. P. Rigaut, France

*Associate Editor

Executive Editor: GILLIAN WILSON

Published for the Royal Microscopical Society
by Blackwell Scientific Publications
Oxford London Edinburgh Boston Melbourne Paris Berlin Vienna

Journal of Microscopy

Patron: HER MAJESTY THE QUEEN

Officers and Council 1992–93

President: M. J. GORINGE

Vice-President: S. BRADBURY

Vice-President and International Secretary: H. Y. ELDER

Executive Hon. Secretary: C. HAMMOND

Hon. Treasurer: C. V. HOWARD

Hon. Secretary (Education): N. G. WRIGLEY

Hon. Secretary (Science): C. J. F. VAN NOORDEN

Ordinary Members of Council:

D. E. ASHHURST
G. R. COULTON
P. CRAWLEY
A. G. CULLIS
P. ECHLIN
P. J. GOODHEW
C. R. M. GROVENOR
M. G. ORMEROD
T. F. PAGE
P. C. ROBINSON

Hon. Joint Editors:

P. ECHLIN
K. M. KNOWLES
T. MATTFELDT
J. B. PAWLEY
D. B. WILLIAMS

Executive Editor: GILLIAN M. M. WILSON

Administrator: P. B. HIRST

Copyright. Papers accepted become the copyright of the journal (© 1992 The Royal Microscopical Society). Authorization to photocopy for internal or personal use or the internal or personal use of specific clients is granted by The Royal Microscopical Society for libraries and other users registered with the Copyright Clearance Centre (CCC) Transactional Reporting Service, provided that the stated base fee of $6.00 per copy is paid directly to the CCC, 27 Congress Street, Salem, MA 01970, U.S.A. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale. Special requests should be addressed to the Editor. 0022-2720/92 $6.00.

Contents of Vol. 165

Part 1

Editorial 1

Editorial 3

F. MEYER. Mathematical morphology: from two dimensions to three dimensions 5

M. RYDMARK, T. JANSSON, C.-H. BERTHOLD and T. GUSTAVSSON. Computer-assisted realignment of light micrograph images from consecutive section series of cat cerebral cortex 29

C. G. MORGAN, A. C. MITCHELL and J. G. MURRAY. Prospects for confocal imaging based on nanosecond fluorescence decay time 49

W. M. PETROLL, H. D. CAVANAGH, M. A. LEMP, P. M. ANDREWS and J. V. JESTER. Digital image acquisition in *in vivo* confocal microscopy 61

TOBIAS DAMM and BERND WILHELMI. Optimum recording conditions in scanning microscopes 71

C. J. COGSWELL and C. J. R. SHEPPARD. Confocal differential interference contrast (DIC) microscopy: including a theoretical analysis of conventional and confocal DIC imaging 81

C. J. COGSWELL, D. K. HAMILTON and C. J. R. SHEPPARD. Colour confocal reflection microscopy using red, green and blue lasers 103

P. A. BENEDETTI, V. EVANGELISTA, D. GUIDARINI and S. VESTRI. Confocal-line microscopy 119

M. R. YOUNG, S. H. JIANG, R. E. DAVIES, J. G. WALKER, E. R. PIKE and M. BERTERO. Experimental confirmation of super-resolution in coherent confocal scanning microscopy using optical masks 131

G. J. BRAKENHOFF and K. VISSCHER. Confocal imaging with bilateral scanning and array detectors 139

ULRICH DIRNAGL, ARNO VILLRINGER and KARL MAX EINHÄUPL. *In vivo* confocal scanning laser microscopy of the cerebral microcirculation 147

BARRY R. MASTERS. Confocal microscopy of the *in situ* crystalline lens 159

JAMES V. JESTER, W. MATTHEW PETROLL, RANDA M. R. GARANA, MICHAEL A. LEMP and H. DWIGHT CAVANAGH. Comparison of *in vivo* and *ex vivo* cellular structure in rabbit eyes detected by tandem scanning microscopy 169

Short Technical Note

C. VYVYAN HOWARD and KONRAD SANDAU. Measuring the surface area of a cell by the method of the spatial grid with a CSLM—a demonstration 183

Book Review 189

Part 2

A. LEFURGEY, S. D. DAVILLA, D. A. KOPF, J. R. SOMMER and P. INGRAM. Real-time quantitative elemental analysis and mapping: microchemical imaging in cell physiology 191

R. D. LEAPMAN and S. B. ANDREWS. Characterization of biological macromolecules by combined mass mapping and electron energy-loss spectroscopy 225

H. DALEN, P. SCHEIE, R. NASSAR, T. HIGH, B. SCHERER, I. TAYLOR, N. R. WALLACE and J. R. SOMMER. Cryopreservation evaluated with mitochondrial and Z line ultrastructure in striated muscle 239

YOSHIRO HANYU, MICHINORI ICHIKAWA and GEN MATSUMOTO. An improved cryofixation method: cryoquenching of small tissue blocks during microwave irradiation 255

PETER O. GERRITS, RICHARD W. HOROBIN and IETSE STOKROOS. The effects of glycol methacrylate as a dehydrating agent on the dimensional changes of liver tissue 273

K. KAYSER, K. SANDAU, J. PAUL and G. WEISSE. An approach based on two-dimensional graph theory for structural cluster detection and its histopathological application 281

A. SASOV. Non-raster isotropic scanning for analytical instruments 289

J. K. PARK and A. J. ARDELL. Solute-enriched surface layers and X-ray microanalysis of thin foils of a commercial aluminium alloy 301

M. AGUILAR, E. ANGUIANO, A. DIASPRO and M. PANCORBO. Digital filters to restore information from fast scanning tunnelling microscopy images 311

Short Technical Note

HENRI A. LEVY, ADA L. OLINS and DONALD E. OLINS. Distribution of projection angles for single-axis-tilt electron microscope tomography of extended thin planar sections 325

Part 3

A. ENTWISTLE and M. NOBLE. The use of polarization analysis in the quantification of fluorescence emission: general principles 331

A. ENTWISTLE and M. NOBLE. The quantification of fluorescence emission from biological samples using analysis of polarization 347

BIAO DING, ROBERT TURGEON and M. V. PARTHASARATHY. Effect of high-pressure freezing on plant microfilament bundles 367

C. J. R. SHEPPARD and MIN GU. The significance of 3-D transfer functions in confocal scanning microscopy 377

LARS M. KARLSSON and LUIS M. CRUZ-ORIVE. The new stereological tools in metallography: estimation of pore size and number in aluminium 391

NIELS MARCUSSEN. The double disector: unbiased stereological estimation of the number of particles inside other particles 417

Short Technical Notes

JENS R. NYENGAARD and HANS JØRGEN G. GUNDERSEN. The isector: a simple and direct method for generating isotropic, uniform random sections from small specimens 427

ANNA-MARIE MCMILLAN and FLEMMING BRANDT SØRENSEN. The efficient and unbiased estimation of nuclear size variability using the 'selector' 433

Book Reviews 439

Index of key words

Al–Zn–Mg alloys, 301
Aluminium, 391
Array detector, 139
Automatic realignment, 29

Bilateral, 139
Biological cryosections, 191
Biological microscopy, 103
Blood cell velocity, 147
Bone histo-morphometry, 183
Brain, 29
Brain cortex, 147

Cardiac muscle, 239
Cat, 29
Cavalieri principle, 391
CCD, 139
Cell physiology, 191
Cluster, 281
Colour imaging, 103
Computer imaging, 191
Confocal, 139
Confocal microscope, 331, 347
Confocal microscopy, 61, 81, 103, 119, 159, 169
Confocal scanning microscopy, 377
Cornea, 169
Cranial window, 147
Cristae mitochondriales, 239
Cryoartefacts, 239
Cryofixation, 239, 255
Cryopreservation, 239
Cryoquenching, 255
Crystalline lens, 159

Dehydration, 273
Design-based estimators, 183
Detection limits, 225
Differential interference contrast (DIC), 81
Digital filter, 311
Digital image, 29
Digital image processing, 29
Disector, 391, 417
Distortion error, 71
Distribution of particle volumes, 391
Double disector, 417

Electron microscope tomography, 325
Electron microscopy, 191
Elemental microanalysis, 225
Error variance, 391
Eye, 159

Fibrosarcoma, 281
Field-emission STEM, 225
Filters, 5
Fluorescence, 139
Fluorscence decay time, 49
Fluorescence imaging, 49
Fluorescence microscopy, 147
Fluorescence polarization, 331
Fluorescence quantification, 331, 347
Freeze-fracture, 239
Freeze-substitution, 239, 367

β-Gell, 255
Glycol methacrylate (GMA), 273
Graph theory, 281

Haemocyanin, 225
Haemoglobin, 225
High-pressure freezing, 367

Image acquisition, 61, 119
Image analysis, 29, 273, 281, 289
Image processing, 5, 289
Imaging theory, 81
Immunofluorescence, 347
Immunogold, 103
In vivo, 61, 169
Isotropic scanning, 289
Isotropy, 427

Laser, 139
Laser beam, 71
Lenticular fibres, 159
Light microscopy, 29, 169
Light sample holder, 255

Mass mapping, 225
Mathematical morphology, 5
Mean particle volume, 391
Measurements, 5
Melanocytic tumour, 433
Membrane collapse, 239
Metal contact freezing, 255
Microchemical microscopy, 191
Microfilament, 367
Microscopy, 139
Microspectroscopy, 119
Microtubule, 367
Microwave radiation, 255
Mitochondria, 239
Morphology, 29
Morphometry, 273

Nerve cell, 29
Noise, 71, 311
Noise error, 71
Nomarski, 81
Nuclear volume, 433

Objective alignment, 29
Optical disector, 433
Optical microscopy, 159
Osteocyte lacunae, 183

Parallel-detection EELS, 225
Particle number, 417
Phase contrast, 81
Phase shift/demodulation fluorometry, 49

Pig liver, 273
Point-sampled intercepts, 391
Pore number, 391
Pore volume, 391
Projections on convex sets (POCS), 325
Propane jet freezing, 367

Quick-freezing, 239

Radiation damage, 225
Raster scanning, 289
Real-time, 61, 139
Reflection bright-field, 103
Renal glomeruli, 417
Resin embedding, 273
Resolution, 71

Sampling, 417
Scanning electron microscopy, 289
Scanning laser microscopy, 81, 103, 159
Scanning methods, 119
Scanning microscopy, 71, 131
Scanning tunnelling microscope, 311
Section thickness, 391, 417
Sectioning, 139
Segmentation, 5
Selector, 391
Serial sections, 29
Skeletal muscle, 239
Spatial registration, 29
Stereology, 183, 391, 417, 427, 433
STM, 311
Super-resolution, 131
Surface films, 301

Three dimensions, 5
Three-dimensional imaging, 81, 103, 377
Three-dimensional microscopy, 391
Three-dimensional reconstruction, 29, 325
Tissue processing, 273
Tobacco, 367
Tobacco mosaic virus, 225
Transfer functions, 377
Tunnelling, 311

Unbiased surface estimation, 183
Uniform orientation, 427

Vertical sections, 427
Vitrification, 255
Volume-weighted mean particle volume, 391

Wiener filter, 311

X-ray mapping, 191
X-ray microanalysis, 191, 301

Z line phenomenon, 239

Index of authors

Aguilar, M., 311
Andrews, P.M., 61
Andrews, S.B., 225
Anguiano, E., 311
Ardell, A.J., 301

Benedetti, P.A., 119
Bertero, M., 131
Berthold, C.-H., 29
Brakenhoff, G.J., 139

Cavanagh, H.D., 61, 169
Cogswell, C.J., 81, 103
Cruz-Orive, L.M., 391

Dalen, H., 239
Damm, T., 71
Davies, R.E., 131
Davilla, S.D., 191
Diaspro, A., 311
Ding, B., 367
Dirnagl, U., 147

Einhäupl, K.M., 147
Entwistle, A., 331, 347
Evangelista, V., 119

Garana, R.M.R., 169
Gerrits, P.O., 273
Gu, M., 377
Guidarini, D., 119
Gundersen, H.J.G., 427
Gustavsson, T., 29

Hamilton, D.K., 103
Hanyu, Y., 255
High, T., 239
Horobin, R.W., 273
Howard, C.V., 183

Ichikawa, M., 255
Ingram, P., 191

Jansson, T., 29
Jester, J.V., 61, 169
Jiang, S.H., 131

Karlsson, L.M., 391
Kayser, K., 281
Kopf, D.A., 191

Leapman, R.D., 225
LeFurgey, A., 191
Lemp, M.A., 61, 169
Levy, H.A., 325

McMillan, A.-M., 433
Marcussen, N., 417
Masters, B.R., 159
Matsumoto, G., 255
Meyer, F., 5
Mitchell, A.C., 49
Morgan, C.G., 49
Murray, J.G., 49

Nassar, R., 239
Noble, M., 331, 347
Nyengaard, J.R., 427

Olins, A.L., 325
Olins, D.E., 325

Pancorbo, M., 311
Park, J.K., 301
Parthasarathy, M.V., 367
Paul, J., 281
Petroll, W.M., 61, 169
Pike, E.R., 131

Rydmark, M., 29

Sandau, K., 183, 281
Sasov, A., 289
Scheie, P., 239
Scherer, B., 239
Sheppard, C.J.R., 81, 103, 377
Sommer, J.R., 191, 239
Sørensen, F.B., 433
Stokroos, I., 273

Taylor, I., 239
Turgeon, R., 367

Vestri, S., 119
Villringer, A., 147
Visscher, K., 139

Walker, J.G., 131
Wallace, N.R., 239
Weisse, G., 281
Wilhelmi, B., 71

Young, M.R., 131